

Basis for Amendments to the Claims

The Applicants have amended Claim 58, consistent with the claim objections by the Examiner in paragraph 3 of the Office Action. No new subject matter is introduced by these amendments to the claim.

DISCUSSION**Background**

The USPTO issued an Office Action dated March 17, 2010 which was responded to by Applicants on May 25, 2010. In response to that Amendment of May 25, 2010, the USPTO issued an Advisory Action wherein the USPTO refused to enter the Amendments that were included with the May 25, 2010 Office Action and continued the rejection of the claims. Accordingly, Applicants file this Preliminary Amendment in response to the Office Action of the USPTO issued on March 17, 2010, the Advisory Action dated June 10, 2010 and make additional arguments for the patentability of the remaining claims of the Application as an element of the submission of a Request for Continued Examination.

Priority

Applicants acknowledge that the papers submitted under 35 U.S.C. Section 119 were admitted and placed in the record.

Specification

Applicants also acknowledge that the amendment to the specification previously submitted has been accepted.

Claim Objections

The USPTO objected to Claim 58. Applicants have amended Claim 58 to remove the informalities, without adding any new subject matter.

Claim rejections under 35 USC §103

The USPTO rejected Claims 16-28, 35-48, and 50-63 under 35 USC §103 as being unpatentable over Katovic, et al. in view of Rosinski, et al., Kuhl and Sumitani, et al., as previously asserted in the Office Actions of October 2, 2009 and March 17, 2010. In addition, the USPTO cited Kresge, et al., U.S. Patent No. 4,599,475 in combination with the previously cited references. Kresge, et al. was cited for the teaching that precipitated silicas of the claimed zeolites have a surface area of less than 200 m²/g, as disclosed at Col. 9, lines 18-22. Applicants respectfully traverse each of the rejections in the previous Office Actions, as well as the arguments in the Advisory Action. In the Advisory Action the USPTO stated that Applicants' arguments made in its Amendment of the 25 of May 2010 had been considered but were not considered persuasive for several reasons:

- 1) The USPTO disagreed with the arguments Applicants made concerning the impropriety of the combination of Katovic, et

al. with Rosinski, et al. and contested the assertions of Applicants regarding the teachings of each of those references.

2) The USPTO also disputed the allegation that Kresge, et al. should not be combined with Katovic, et al. or Rosinski, et al. as the USPTO continues to assert that the teaching of Kresge, et al. concerning ZSM-23 zeolites is appropriate to consider in combination with the teachings of Katovic, et al. and Rosinski, et al. for processes for the production of ZSM-12 zeolites.

3) Finally, the USPTO contested the assertions of the Applicants concerning the teachings of Katovic, et al. in combination with the other references.

The Invention

Applicants developed a process for the production of a new zeolite of the ZSM-12 type, which is particularly useful for a number of reactions with organic materials, including specifically hydroisomerization of saturated linear hydrocarbons having a carbon number of more than 5. It was discovered that when the claimed process is used for synthesis of the novel ZSM-12 zeolite, advantageous properties of that ZSM-12 zeolite are exhibited. This novel process comprises a) preparing a synthesis gel in an aqueous solution or suspension comprising 1) an aluminium source, 2) a silicon source,

comprising a precipitated silica having a BET surface area less than or equal to 200 m²/g, 3) TEA⁺ as the template, and 4) an alkali metal or alkaline earth metal ion source M having a valency of n, wherein the molar H₂O:SiO₂ ratio of the gel is within a range from 5 to 15; b) crystallizing the synthesis gel under hydrothermal conditions while being stirred, so as to obtain a solid; and c) removing the solid from the solution in order to obtain the ZSM-12 type zeolite, wherein the ZSM-12 zeolite has a primary crystal size less than or equal to 0.1 μm and a specific volume, determined by mercury porosimetry at a maximum pressure of 4,000 bar, of 30 to 200 mm³/g in a pore radius range of 4-10 nm.

The primary reference cited by the USPTO is Katovic, et al. which disclose a method of synthesizing ZSM-12 zeolites. The primary focus of Katovic, et al. is which process steps encourage the formation of ZSM-12 zeolites and which process steps discourage such formation. For example, in Table 1 on p. 970 Katovic, et al. describe 8 processes where the processes vary. There are several significant distinctions between the process disclosed in Katovic, et al. which produces ZSM-12 and the process, as claimed. Several of these distinctions have been acknowledged by the USPTO.

1) Specifically, Katovic, et al. teach a H₂O:SiO₂ molar ratio of 20. (See Abstract, Table 1 and Figures 1 and 2.) The

USPTO asserts that Katovic, et al. is silent as to $\text{H}_2\text{O}:\text{SiO}_2$ molar ratios other than 20 for use in the process producing a ZSM-12 material. The USPTO attempts to limit the impact of this limited disclosure by stating that the disclosure of the $\text{H}_2\text{O}:\text{SiO}_2$ molar ratio is only present in the Abstract of Katovic, et al. Note however that this ratio is also the ratio of all Examples disclosed in Table 1 and Figures 1 and 2 on pages 970 and 971 of Katovic, et al. A person skilled in the art reviewing the entire disclosure of Katovic, et al. would immediately recognize the importance of the only disclosed $\text{H}_2\text{O}:\text{SiO}_2$ ratio of 20.

2) In addition, the method of synthesis in Katovic, et al. differs from the claimed process. To emphasize the distinction between zeolites formed using processes where the $\text{H}_2\text{O}:\text{SiO}_2$ ratios of the gel were 20 or greater and zeolites formed from the process of the Application, Applicants filed comparative test results with the EPO during processing of the corresponding PCT Application, a copy of which was attached to the Amendment filed on December 22, 2009, as Exhibit A. They showed that zeolites, formed using the process of the invention, but with a ratio of $\text{H}_2\text{O}:\text{SiO}_2$ at 20:1 or higher, as disclosed by Katovic, et al., were not ZSM-12 zeolites but rather MFI zeolites. If desired, Applicants will present this comparative test data in the form of an affidavit.

3) In addition, Katovic, et al. fail to teach the stirring of the mixture during the crystallization process, a required element of the claims.

4) Further, Katovic, et al. are silent as to the BET surface area of the silica used or the physical characteristics of the produced ZSM-12 zeolite, which are specifically claimed by Applicants.

To overcome the deficiency in molar ratio of $H_2O:SiO_2$ in Katovic, et al., the USPTO cited Rosinski, et al. Rosinski, et al. disclose a method for producing ZSM-12 zeolites. In one example, Example IV, a process was disclosed for producing a ZSM zeolite with a molar $H_2O:SiO_2$ ratio of about 13.5. However, the process of Rosinski, et al. is entirely different from Applicants' process, and also different from the process of Katovic, et al., as Rosinski, et al. teach that colloidal silica is the only silica source disclosed by all Examples. (See Ex. I, Col. 8, line 3; Ex. II, Col.9, line 14; Ex. III, Col. 10, line 4; Ex. IV, Col. 11, line 16; Ex. VI, Col. 12, line 31; Ex. VII, Col. 12, lines 64-65; and Ex. VIII, Col. 13, line 18.) In response to this argument, the USPTO asserted in the Advisory Action that "[t]he applicant also asserts that Rosinski requires the use of colloidal silica, but the examples cited by applicant to support this conclusion do not indicate that colloidal silica is required only that colloidal silica

may be utilized in the process. The conditions of the exemplary embodiments disclosed by the prior art can not be utilized to infer negative teachings as attempted by applicant." (Advisory Action, p. 2). The USPTO then asserts that one of ordinary skill in the art would expect the general teachings of Rosinski that employ colloidal silica to also apply to other forms of silica such as precipitated silica. Then the Examiner "boot straps" his argument by asserting that the source of silica in Rosinski, et al. is supported by the disclosure of Katovic, et al. "...because Katovic discloses that both colloidal and precipitated silicas may be used in the process to produce ZSM-12." (Advisory Action, p. 3).

The distinction between the use of colloidal silica and precipitated silica to produce the claimed zeolite was quite important to Applicants. The particular type of silica chosen, when using Applicants' process, produces distinctively different zeolite products. In the Application, Inventive Examples 1 and 9 used "precipitated silica" while "Comparative Example 5" used "colloidal silica". The zeolite product produced in Comparative Example 5, using colloidal instead of precipitated silica, contained 30% ZSM-5, instead of ZSM-12, as a by-product. (See Example 5.) In addition, the physical characteristics of the zeolites produced by Inventive Examples 1 and 9 vs. Comparative Example 9 were quite different, as

shown in Table 5 on page 28 and Table 6 on page 29 of the Application. Note particularly that the elemental composition of the components used in Examples 1 and 5 are the same. Yet different products are produced because of the form of silica use varied. The teachings of the Application concerning the presence of ZSM-5 in the zeolite when colloidal silica is used instead of precipitated silica is supported by Katovic, et al. See Table 1 comparing samples 1 and 3 with sample 4, as will be further discussed.

The **actual** teachings of Rosinski, et al. and Katovic, et al. to a person skilled in the art are quite important, as the Examiner relies solely on the teaching of Katovic, et al. in combination with Rosinski, et al. to disclose what is claimed by Applicants. As stated above, Applicants claim zeolite products produced using "precipitated silica" as opposed to "colloidal silica." In reviewing the "asserted" disclosure of Katovic, et al. and Rosinski, et al. the following is the actual teaching:

1) The only form of silica that is specifically disclosed in Rosinski, et al. for the preparation of a ZSM-12 zeolite is "colloidal silica." See Examples I through VIII. The Examiner is correct that Rosinski, et al. fails to teach the negative that a ZSM-12 can not be produced using precipitated silica instead of colloidal silica. However, the only affirmative

teaching to a person skilled in the art from Rosinski, et al. is what is actually disclosed and taught not what could have been taught or what was not specifically taught. Rosinski, et al. could have taught a number of processes for the production of their ZSM-12. However, the only process that was actually disclosed is the use of colloidal silica for the production of a ZSM zeolite. A person skilled in the art can not anticipate what might have been disclosed. Rather, he must rely on what was actually disclosed by Rosinski, et al., which is the use of "colloidal silica." A similar circumstance was present in Exxon Research v. US, 60 USPQ 2d 1972, 1283 (CAFC 2001). In this case one key issue was the meaning of the terms, "U_G" and "U_L". The US sought to have these terms interpreted consistently. The Court disagreed and concluded that because the specification nowhere disclosed the interpretation sought by the US, a "negative inference" would be drawn by a person skilled in the art. Therefore the interpretation sought by the US was disallowed.

2) With regard to the teachings of Katovic, et al. concerning the type of silica to use to produce zeolites, there is a disclosure of the use of two different forms: fumed or colloidal silica and precipitated silica to attempt to form ZSM-12. (See pages 969 and 970.) The USPTO focuses on this "disclosure" on page 3 of the Advisory Action by stating

One of ordinary skill in the art would expect general teachings of the process disclosed by Rosinski that employs colloidal silica, such as possible $\text{H}_2\text{O}:\text{SiO}_2$ molar ratios, to apply to the process disclosed by Katovic because Katovic discloses that both colloidal and precipitated silicas may be used in the process to produce ZSM-12. (Advisory Action, p. 3).

Applicants respectfully assert that the teaching of Katovic, et al. to a person skilled in the art is that only precipitated silica can be used for the efficient production of a ZSM-12 zeolite. This is absolutely clear from Table 1 on page 970, which discloses 8 samples, each produced using different compositions. Of these 8 samples, only sample 4 produced substantially all ZSM-12. The USPTO in the detailed Office Action disputes this clear teaching of Table 1 and stated, "Applicant asserts that Katovic requires the use of precipitated silica for the formation of ZSM-12, but Examples 1 and 3 disclosed by Katovic utilize fumed silica and produce ZSM-12 zeolites (p. 969)." To analyze the accuracy of this statement, it is necessary to review the actual disclosure on page 969 of Katovic, et al. on which the USPTO relies for its assertion? The disclosure concerning Samples 1 and 3 on page 969 of Katovic, et al. specifically states as follows "[i]n fact, when the fumed Aerosil silica was used, the main synthesis product was the ZSM-5 zeolite (samples 1 and 3) which appeared together with α -quartz and traces of ZSM-12." Thus, if a person skilled in the art wishes to produce a ZSM-5 zeolite

or wishes to use a process to produce a ZSM-5 with trace amounts of ZSM-12, then the process of samples 1 and 3 would be useful using "fumed" silica. However, that is not the assertion of the USPTO in its Advisory Action. In addition, Katovic, et al. go further on page 969 in the next sentence by stating "On the contrary, by using precipitated silica the co-crystallization of ZSM-5 and ZSM-12 zeolites was not observed (samples 2 and 4)." Note specifically, that only with Example 4 is the primary product that is produced a ZSM-12 zeolite. While there are a number of other criteria in the process of Katovic, et al. that also must be satisfied to produce a ZSM-12 zeolite, to a person skilled in the art reviewing the disclosure of Katovic, et al., one criteria that cannot be modified is the use of precipitated silica. The teaching of samples 1 and 3 are that when fumed silica is used, regardless of the other conditions, including ratio of sodium to TEA to aluminium, ZSM-12 is not produced except in trace amounts. Note the conclusion of Katovic, et al. on page 972 concerning the use of "fumed silica" verses "precipitated silica."

The ZSM-12 synthesis from fumed Aersil silica is not reported in open literature, probably because this very active source of silica (its alkaline solutions contain mainly silicate monomers) favours the ZSM-5 zeolitic phase formation.

Thus, it can not be argued that a person skilled in the art reviewing Katovic, et al. would have been taught that fumed silica could be used for the production of ZSM-12. Rather, only the use of precipitated silica is taught.

Accordingly, a person skilled in the art would not combine the process of Katovic, et al. with that of Rosinski, et al. as the choice of the type of silica is opposite, i.e. one discloses only the use of "colloidal silica" (Rosinski, et al.), while the other states that only "precipitated silica" should be used to produced ZSM-12 zeolites (Katovic, et al.) and fumed silica "favours the ZSM-5 zeolitic phase formation." Thus, the disclosure of Rosinski, et al. teaches away from the disclosure of Katovic, et al. or the Application.

The obviousness rational addressed in KSR was premised on combining elements known in the prior art. However, as stated in Ex Parte Whelan, 89 USPQ 2d 1078, 1084:

The KSR Court noted that obviousness can not be proven merely by showing that the elements of a claimed device were known in the prior art; it must be shown that those of ordinary skill in the art would have had "apparent reason to combine the known elements in the fashioned claim."

There is clearly no "apparent reason" to combine Katovic, et al. with Rosinski, et al., as each teach opposite processes for the production of ZSM-12.

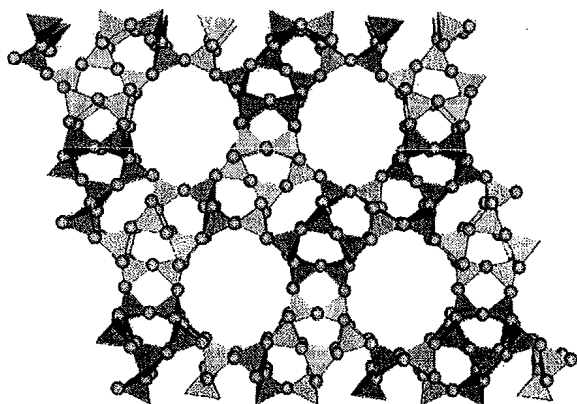
To further distinguish the composition as claimed from the cited references, Applicants previously amended the claims to introduce a limitation of a BET surface area of the silica source of less than or equal to 200 m²/g. The USPTO acknowledged that this limitation was not disclosed by Katovic, et al. or Rosinski, et al.

In order to show the claimed surface area of the precipitated silica that is used for the production of the ZSM-12 type zeolite claimed by Applicants, the USPTO cited Kresge, et al. In fact, Kresge, et al. disclose an entirely different zeolite product used for an entirely different process with an entirely different structure. The present invention discloses a process for preparing a ZSM-12-type zeolite for catalytic hydroisomerization of higher paraffins. As recited on page 17, second paragraph of the Application, higher paraffins are understood to mean saturated linear hydrocarbons having a carbon number more than 5 and, in particular, the catalyst is intended for the hydroisomerization of N-heptane and N-octane.

In contrast, Kresge, et al. disclose a process for the isomerization of unsaturated aromatic hydrocarbons, in particular for the isomerization of xylenes, using a **ZSM-23** type zeolite. There are several significant differences between zeolites of the ZSM-12 type and the ZSM-23 type, in particular, their pore size. A ZSM-12 zeolite is a large pore zeolite, the

structure of which comprises 12 membered rings as the largest ring in their structure. Due to the 12 membered rings, this type of zeolite has a free diameter of 0.6 nm. On the other hand, ZSM-23 is a medium pore diameter comprising 10 membered rings, resulting in a free diameter of 0.45 nm. (See the differences shown below.)

12 MR ZSM-12



10 MR ZSM-23

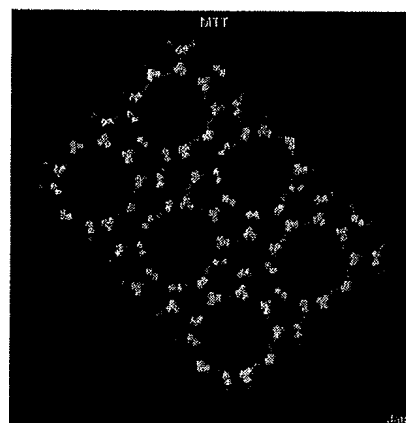
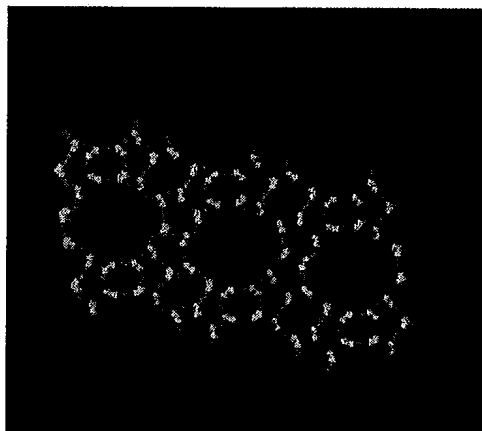
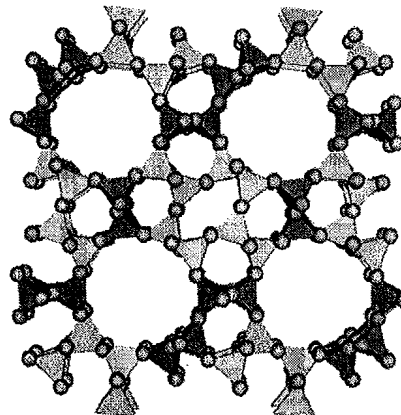


Figure 1: Structural models of ZSM-12 and ZSM-23 type zeolites.

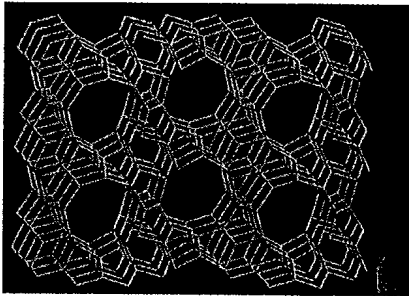
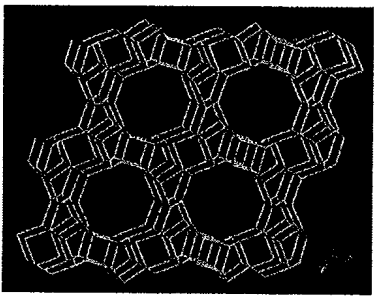
ZSM-23	ZSM-12
	
Pore Opening in Å: 4,5 x 5,2	Pore Opening in Å: 6,0 x 5,9 x 5,6
Framework Type MTT	Framework Type MTW
Ring Size (#T-atoms): 10, 6, 5	Ring Size (#T-atoms): 12, 6, 5, 4
Channel system: 1-dimensional	Channel system: 1-dimensional

Table 1: Structural differences between ZSM-12 and ZSM-23 type zeolites.

Because of this difference in pore size, these two zeolites have different fields of catalytic application. The pore size of the zeolite catalyst is critical for catalytic selectivity for hydroisomerization. While ZSM-12 type zeolites are particularly suitable for isomerization of aliphatic paraffins, as disclosed by the Application, ZSM-23 type zeolites are especially preferred for isomerization of aromatic hydrocarbons, in particular, o- and m-xylenes. Another field of application for ZSM-23 zeolites is the hydroisomerization of hydrocarbons with very long aliphatic chains (waxes).

A person skilled in the art seeking to discover an improved ZSM-12 zeolite for catalytic hydroisomerization of higher olefins, in particular having a carbon atom number of 7 or 8, would not consider Kresge, et al. as being of any

relevance as it employs a completely different type of isomerization reaction, using a different catalyst, namely a ZSM-23 catalyst, which is known to have a different structure and different application compared to a ZSM-12 catalyst.

The fact that precipitated silica having a surface area 140 to 160 m²/g is used to form a ZSM-23 catalyst would not motivate a person skilled in the art to combine the teachings of Kresge, et al. with the teachings of Katovic, et al. or Rosinski, et al. which disclose ZSM-12 zeolites. It is simply not proper to combine teachings which disclose a process to produce a ZSM-23 catalyst when trying to determine the best process to produce ZSM-12 zeolites. As noted above, obviousness can not be proven merely by showing that the elements of a claimed device were known in the prior art. There are literally dozens of ZSM zeolites, artificial and natural. Katovic, et al. and Rosinski, et al. show that different processes can be used even for the production of a ZSM-12 zeolite. Why would a person skilled in the art select a process for producing ZSM-23, when he was creating a ZSM-12 zeolite? How would he choose which process steps to pick and which not to follow for the production of a ZSM-12 zeolite? It must be shown that a person of ordinary skill in the art would have had an "apparent reason" to combine the known elements in the same fashion to claim the invention, see KSR.

In response to this argument, the USPTO asserts the following in the Advisory Action:

That the zeolite produced by Kresge is not the same as the ZSM-12 produced by Katovic and is utilized in a different manner would not prevent one of ordinary skill in the art from considering the teachings of Kresge with regard to possible raw materials that may be utilized to produce zeolites when considering the lack of guidance provided in Katovic with regard to the surface area of the precipitated silica.

The USPTO concluded that because it has discovered a patent that discloses a ZSM-23 zeolite utilizing precipitated silica having a particular surface area which is the same as that claimed by the Applicants for a process for producing a ZSM-12 type zeolite is sufficient to combine Katovic, et al. with Rosinski, et al. to disclose the inventive process. KSR has been interpreted by the courts to require for proof of obviousness that there was an apparent reason to combine the known elements in the fashion claimed by the patents at issued. KSR, 550 US at 418. Thus, the courts have concluded that obviousness requires not only evidence of the elements, but some motivation to combine the references. Fresenius USA, Inc. v Baxter International, 92 USPQ 2d, 1163, 1173-1174 (CAFC 2009). See also Ex parte, Whalen, 89 USPQ 2d, 1078, 1084 (BPAI 2008). The USPTO has provided no apparent reason to combine the teachings of a ZSM-23 catalyst with that of a ZSM-12, especially with the vast differences in these zeolites.

The determination of the USPTO is nothing more than trying to prove "obvious to try." In order to meet this criteria the courts have asserted that obviousness is not proven when there are a large number of possibilities in a field unreduced by the direction of the prior art. As is clear from the prior art, different processes for the use of silicas for the production of various zeolites are disclosed. When the prior art requires a person skilled in the art to vary various parameters and to try numerous possible choices until one possibly arrives at a result that is successful, then there is no proof of obviousness. Bayer Schering Pharma AG v Barr Laboratories, Inc., 91 USPQ 2d 1569, 1572-73 (CAFC 2009).

Accordingly, no person skilled in the art would combine the teachings of processes to produce a ZSM-23 catalyst with those for a ZSM-12 catalyst. Thus, the teachings of Kresge, et al. are not relevant to the patentability of this Application or any of the claims thereunder.

The teachings of Kuhl do not overcome the deficiencies in Katovic, et al. and Rosinski, et al. or add to their teachings, as Kuhl was merely cited to disclose that the reaction mixture may be either static or stirred. (Page 6 of Office Action.)

Finally, it is not necessary to discuss the teachings of Sumitani, et al., as Sumitani, et al. was cited merely to disclose a process for producing ZSM-12 zeolites utilizing

washing with pure water until the ion conductivity of the wash water is less than 50 $\mu\text{S}/\text{cm}$. (See paragraph 8, page 10 of the Office Action.)

Neither of these references overcome the deficiencies in the disclosures of the combination of Katovic, et al., Rosinski, et al. and Kresge, et al.

Accordingly, none of the references alone or combined teach each of the unique elements of the inventive process for producing a zeolite of the ZSM-12 type, as claimed by Applicants. In fact, the teachings of the primary references, Katovic, et al. and Rosinski, et al. are in an irreconcilable conflict as to an important process step. The teachings of Kresge, et al. are also in conflict with the teachings of Katovic, et al., Rosinski, et al. and the Application. In cases in which the prior art teaches away from a chemical composition recited in the claims, obviousness can not be proved merely by showing that each of the elements, as claimed, is present. See Ex Parte Whelan, id.


Because of these distinctions in the teachings of the cited references, a person skilled in the art would not know which features of the processes of the various cited references should be combined. What should be the molar $\text{H}_2\text{O}:\text{SiO}_2$ ratio when the references are in conflict? What should be the type of silica used to form the gel? What should be the BET surface

area of the silica source when it is not taught by any of the relevant references for the production of ZSM-12 catalysts? It can not be asserted that the properties of the combined references would be the same as is claimed when a person skilled in the art does not know what process steps from which references to choose because of the conflict among the references.

CONCLUSION

Applicants respectfully assert that all bases for rejection of the claims of the Application have been overcome and request the issuance of a Notice of Allowability. If there are any questions, please contact Applicants' counsel.

Respectfully Submitted,



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DATE: July 16, 2010

CERTIFICATE OF EFS SUBMISSION (37 C.F.R. § 1.8(a)(i)(1)(C))

I hereby certify that, on the date shown below, this correspondence is being submitted to the Patent and Trademark Office via the Office Electronic Filing System in accordance with § 1.6(a)(4).

Date: July 16, 2010

Holly Hart
Signature